Nevada Division of Environmental Protection
Bureau of Water Quality Planning

-D-R-A-F-T-

Proposed Revisions to Ambient Water Quality Criteria for Ammonia

FACT SHEET
August, 2002

Background

Section 303 of the Clean Water Act and 40 CFR 131 give states responsibility for setting, reviewing and revising water quality standards. Water quality standards include criteria that provide limits on a particular pollutant or limits on a condition of a waterbody designed to protect and support a designated use. Under Section 304(a) of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) publishes and periodically updates water quality criteria reflecting the latest scientific data and information on the environmental effects of pollutants. The revised criteria are used by states to modify water quality standards that provide for the protection and propagation of aquatic life and wildlife; for recreation in and on the water; public water supplies; and agricultural and industrial uses. State of Nevada requirements for water quality standards are contained in the Nevada Revised Statutes 445A.425 and 445A.565 and water quality standards for waters of Nevada are found in the Nevada Administrative Code (NAC) 445A.119 through 445A.225.

The Nevada Division of Environmental Protection (NDEP) is proposing replacing the un-ionized ammonia standards with total ammonia criteria for various waterbodies throughout the state. The proposed criteria are based upon EPA recommendations for the protection of aquatic life. This proposal involves replacing existing ammonia criteria for the following designated waterbodies: Carson River system, Walker River system, Chiatovich Creek, Indian Creek, Leidy Creek, Virgin River, Beaver Dam Wash, Snake Creek, Truckee River system, Colorado River system, Humboldt River system, Muddy River, Meadow Valley Wash, and Snake River system.

Aquatic life water quality toxicity criteria are generally expressed as acute or chronic values. Acute refers to the toxic effects in the short term (1 hour average) and acute symptoms include visible signs of stress, like disorientation and death. Chronic refers to toxicity in the long term (30 day average); the chronic effects being not as visible and much more subtle. These effects may include poor life cycle success, decreased reproduction, kidney dysfunction, and gill tissue damage.

The EPA recommended aquatic life, total ammonia criteria are not single-values but instead are site-specific values determined via algebraic relationships. The proposed acute ammonia criteria (CMC – criteria maximum concentration) are dependent on pH and whether sensitive coldwater fish species are present. A summary of the total ammonia acute criterion values over the pH range 6.5 to 9.0 for the presence or absence of coldwater fish species are shown in Table 1.

Chronic criteria are recommended based on the pH and temperature of the waterbody and are categorized depending on whether fish early life stages are present or absent. Summaries of the proposed ammonia chronic criteria (CCC – criteria continuous concentration) are presented in Tables 2 and 3. Total ammonia criterion values are shown for the pH interval 6.5 to 9.0 and the temperature range 0 ° C to 30 ° C.

NDEP is not proposing to modify the existing un-ionized ammonia criteria in the water quality standards for the Class Waters; Smoke, Bronco, and Gray Creeks; Lake Tahoe and tributaries; Lake Mead; and Las Vegas Wash. Revisions to the ammonia criteria to reflect EPA's recommendations will be done as part of future site-specific water quality standards review for these waterbodies. Additionally, no changes are proposed for the sections of rivers contained on tribal lands, which include the Walker River from the inlet to Walker Lake to Weber

Reservoir, the Truckee River from the inlet to Pyramid Lake to the Wadsworth gage, and the East Fork Owyhee River at the Nevada-Idaho stateline. Pursuant to the 1987 Amendments to the Clean Water Act, authorized tribes rather than states have authority for setting water quality standards and implementing regulations for waters on tribal lands.

Workshops are held to obtain comments on proposed revisions to water quality standards from federal, state and local agencies and the general public. After consideration of the public comments, the proposed standards are presented at a public hearing to the State Environmental Commission (SEC) for review and adoption. Standards adopted by the SEC are then subject to approval by the USEPA.

Public Workshops:

Tuesday, August 27, 2002
Nevada Division of Environmental Protection
123 W. Nye Lane
Carson City, NV 89701
Conference Room 217
6:00 to 8:00 pm

Thursday, August 29, 2002
Elko Convention Center
700 Moren Way
Elko, NV 89801
6:00 to 8:00 pm

Wednesday, September 4, 2002
Las Vegas Water District
1001 South Valley View
Las Vegas, NV 89107
Mead Conference Room
6:00 to 8:00 pm

For questions, comments or additional information please contact:

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Table 1. The one-hour average (Acute Criteria) concentration for Total Ammonia (in mg nitrogen per liter) for the protection of fresh water aquatic life. (The concentration of total ammonia may not exceed the acute criterion listed under "Coldwater Fish Present" and/or "Warmwater Fish Present", more than once every three years on the average.)

ACUTE AMMONIA WATER QUALITY CRITERIA FOR FRESHWATER AQUATIC LIFE (mg Nitrogen/L)		
pH	Coldwater Fish Present[1]	Warmwater Fish Present[2]
6.5	32.6	48.8
6.6	31.3	46.8
6.7	29.8	44.6
6.8	28.1	42.0
6.9	26.2	39.1
7.0	24.1	36.1
7.1	22.0	32.8
7.2	19.7	29.5
7.3	17.5	26.2
7.4	15.4	23.0
7.5	13.3	19.9
7.6	11.4	17.0
7.7	9.65	14.4
7.8	8.11	12.1
7.9	6.77	10.1
8.0	5.62	8.40
8.1	4.64	6.95
8.2	3.83	5.72
8.3	3.15	4.71
8.4	2.59	3.88
8.5	2.14	3.20
8.6	1.77	2.65
8.7	1.47	2.20
8.8	1.23	1.84
8.9	1.04	1.56
9.0	0.885	1.32

[1] The acute water quality criteria for total ammonia where coldwater fish are present were calculated using the following equation, which may also be used to calculate unlisted values:

Acute water quality criteria for ammonia (coldwater fish present) =

$$\left[\frac{0.275}{1+10^{7.204-pH}}\right]+\left[\frac{39.0}{1+10^{pH-7.204}}\right]$$

[2] The acute water quality criteria for total ammonia where warmwater fish are present were calculated using the following equation, which may also be used to calculate unlisted values:

Acute water quality criteria for ammonia (warmwater fish present) =

$$\left[\frac{0.411}{1+10^{7.204-pH}}\right]+\left[\frac{58.4}{1+10^{pH-7.204}}\right]$$

NOTES:

pH and temperature are field measurements taken at the same time and location as the water sample destined for the laboratory analysis of ammonia. If field measured pH and/or temperature values fall between the above tabular values, round field measured values according to standard rounding procedures to nearest tabular value to determine ammonia standard or use above described equations.

Table 2. The thirty-day average (Chronic Criteria) concentration for Total Ammonia (in mg nitrogen per liter) for the protection of fresh water aquatic life when fish early life stages may be present. (The concentration of total ammonia may not exceed the chronic criterion more than once every three years on the average. In addition, the highest 4-day average within the 30-day period should not exceed 2.5 times the chronic criterion.)

TABLE 2. CHRONIC AMMONIA CRITERIA FOR WATERS
WHERE FRESHWATER FISH EARLY LIFE STAGES MAY BE PRESENT
(mg Nitrogen/L)[1]

	Temperature (°C)									
pH	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	4.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.0	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.8	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

[1] The freshwater chronic water quality criteria for total ammonia when fish early life stages may be present were calculated using the following equation, which may also be used to calculate unlisted values:

Freshwater chronic water quality criterion for ammonia (fish early life stages present) =

$$\left[\frac{0.0577}{(1+10^{7.688-pH})} + \frac{2.487}{(1+10^{pH-7.688})} \right] \times \text{MIN}\left[2.85,\ 1.45\times 10^{0.028\times(25-T)}\right] \text{ where T = °C.}$$

× Indicates multiplication. MIN indicates the lesser of the two values separated by a comma.

NOTES:

pH and temperature are field measurements taken at the same time and location as the water sample destined for the laboratory analysis of ammonia. If field measured pH and/or temperature values fall between the above tabular values, round field measured values according to standard rounding procedures to nearest tabular value to determine ammonia standard or use above described equation.

Table 3. The thirty-day average (Chronic Criteria) concentration for Total Ammonia (in mg nitrogen per liter) for the protection of fresh water aquatic life when fish early life stages are absent. (The concentration of total ammonia may not exceed the chronic criterion more than once every three years on the average. In addition, the highest 4-day average within the 30-day period should not exceed 2.5 times the chronic criterion.)

TABLE 3. CHRONIC AMMONIA CRITERIA FOR WATERS
WHERE FRESHWATER FISH EARLY LIFE STAGES ARE ABSENT
(mg Nitrogen/L)[1]

	Temperature (°C)									
pH	0-7	8	9	10	11	12	13	14	15[2]	16[2]
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36	5.97
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25	5.86
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10	5.72
6.9	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33	5.93	5.56
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73	5.37
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49	5.15
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22	4.90
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92	4.61
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59	4.30
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23	3.97
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85	3.61
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47	3.25
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71	2.54
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36	2.21
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03	1.91
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85	1.74	1.63
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48	1.39
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06	0.990
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892	0.836
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754	0.707
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684	0.641	0.601
8.9	0.917	0.860	0.806	0.756	0.709	0.664	0.623	0.584	0.548	0.513
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471	0.442

[1] The freshwater chronic water quality criteria for total ammonia where fish early life stages are absent were calculated using the following equation, which may also be used to calculate unlisted values:

Freshwater chronic water quality criterion for ammonia (fish early life stages absent) =

$$\left[\frac{0.0577}{(1+10^{7.688-pH})}+\frac{2.487}{(1+10^{pH-7.688})}\right]\times 1.45\times\left[10^{\,0.028\times(25-MAX(T,7))}\right]$$ where T = °C.

× Indicates multiplication. MAX indicates the greater of the two values separated by a comma.

[2] At 15°C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present.

NOTES:

pH and temperature are field measurements taken at the same time and location as the water sample destined for the laboratory analysis of ammonia. If field measured pH and/or temperature values fall between the above tabular values, round field measured values according to standard rounding procedures to nearest tabular value to determine ammonia standard or use above described equation.